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ABSTRACT

Mathematics contests, such as the American Mathematical Association of Two-Year Colleges' Student Mathematics League competition, are an excellent vehicle for identifying talented students and promoting mathematics scholarship. On-campus tournaments can supplement the Student Mathematics League national competition, by providing immediate feedback of results and additional opportunities to recognize outstanding scholars and improve the problem-solving skills of competitors. The tournament consists of two parts: in the morning, individual competitors take a 90-minute multiple-choice calculus test, and in the afternoon, a 10-round competition takes place in which competitors solve problems working to beat the clock in teams of four. Individual champions are determined solely by the morning test, whereas the team champions are determined by both the individual team members' morning scores and the team's overall afternoon performance. This booklet offers guidelines for hosting a mathematics tournament. Following introductory sections, the booklet focuses on: (1) means of obtaining support for the tournament, including human, facility, and financial resources; (2) preparations 6 months, 4 months, 2 months, 1 month, and 1 week before the tournament; (3) things to do the day of the tournament; and (4) follow-up activities for the day and week after the tournament. Appendices include budget guidelines and sample letters and forms. (MAB)

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ED 366 382

HOSTING A

MATHEMATICS TOURNAMENT

FOR

TWO-YEAR COLLEGE STUDENTS

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G. T. Smith

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JC 940 102

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1. Mathematics competitions for two-year college students

Mathematics contests are an excellent vehicle for both identifying talented students and promoting mathematics scholarship. The AMATYC Student Mathematics League is a national competition for two-year college students. Approximately 100 colleges participate in this three round contest. A local moderator sends the results to a national director, who compiles the data to determine individual and team rankings. The team score for any one round is the sum of the best five individual scores for that round. The League was established in 1980 and has provided an excellent opportunity to recognize outstanding mathematics achievement on the national level.

The tournament described in this booklet, on the other hand, is an on-site competition for two-year college mathematics students. It is an all-day tournament with both individual and team competitions. The competitors assemble in one place for the day, probably a Saturday. This head-to-head competition provides an element of excitement with immediate feedback of results which the AMATYC Student Mathematics League cannot provide. Further, the team competition involves actual teamwork and is not merely the sum of individual scores. Such a tournament is certainly not meant to replace the AMATYC Student Mathematics League, but rather to supplement it with a different type of competition, providing additional opportunities to recognize outstanding mathematics talent, while improving the problem solving skills of the competitors.

2. A brief description of the tournament

The tournament consists of two parts: a morning individual competition consisting of a multiple choice calculus test and an afternoon competition where the competitors solve problems working as a team of four persons. The individual champions are determined solely by the morning test, whereas the team champions are determined by both the individual team members performance on the morning test and the afternoon team competition.

The ninety minute morning calculus competition consists of fifty multiple choice questions through the level of a second semester of calculus. While the students are taking the test, the sponsors have an articulation session. Immediately upon conclusion of the test, the students are given the answers as they depart for lunch. They are permitted to keep the exam and any scratch paper they used. The answer sheets are machine graded during the lunch break, but the individual winners are not announced until the awards ceremony at the end of the day. However, sums of the four individual team members' scores are posted at the beginning of the afternoon team competition to determine the initial standings of the teams as the afternoon team competition begins.

The afternoon team competition consists of ten rounds with from one to four short answer questions per round. Each team has one answer form for each question. When a team is ready to turn in an answer, one team member writes it on the appropriate answer form and holds it high in the air to be collected by a proctor. The proctor writes the possible point

value, based on time, on the answer form and delivers it to the scorer's table. The possible point value is ten during the first minute, nine during the second minute, eight during the third minute, etc. The scorer awards the points to the team if the answer is correct. If the answer is incorrect, the score is zero for that question. There are a total of twenty questions given during the ten rounds. On rounds where multiple questions are given, a team works the problems in any order desired, either together on one problem at a time or individually on different problems, and turns in answers in any order desired. During the afternoon competition, the team standings are updated at the end of each round.

An awards ceremony immediately follows the competition. First team trophies are presented to the top teams. Then plaques are presented to the top individuals, with announcement of accompanying cash awards.

3. Obtaining support

In order to prepare for a tournament, you will need the help and support of a few people. First, you need one or two other faculty who are committed to the project. One person can be the instigator, driving force, and leader, but one person would be hard pressed to do all of the work necessary in preparing for the tournament. Second, you need the support of your department chair, and/or dean, and/or vice president depending on the political structure at your college. You need this support not only for "permission" to hold the tournament, but also to help with obtaining the financial resources you will need.

Obtaining financing for the tournament is a challenge you have to meet before you can make the final decision to move forward. The two major costs involved are food and awards. Cash awards for the top students in the competition serve to appropriately acknowledge superior achievement in mathematics and also help to promote interest in the tournament. All of the other costs involved are relatively minor. The appendix contains more information on a budget for the tournament.

For the source of funds, there are several possibilities. There may be student activity money at your college that can be used to fund, or partially fund, the project. If your college has an Endowment Corporation, they may be able to help. You could charge an entry fee for the competition to help with some or all of the costs. There may be local industry who will support you. The important thing is to persist; the cause is worthy.

Our first two years, we relied on funds from Student Activities, our Endowment Corporation, and our dean. Those were mostly one-time sources, and when Student Activities severely cut our budget for this year (determined by students, who change from year to year, resulting in lack of consistency), we knew we had to consider alternatives. This year we are charging a registration fee of $150 per participating college to cover the cost of the tournament. Our dean contacted administrators at invited colleges and obtained commitments to cover the fee. Thus we were able to invite potential sponsors and assure them that their college had already pledged support. You want to do everything you can to make it as easy as possible for sponsors to participate.

4. Getting ready for the tournament

Once you have decided to move forward and have obtained the necessary support, the hardest part is behind you. Lots of work lies ahead, but it is all clearly spelled out for you in this booklet. Using the detailed time-line which follows will ensure that you will be ready to stage the tournament when the day arrives.

A. Six months before the tournament

1. Set the date for the tournament. This will require consideration of factors such as gymnasium availability, conflicts with college vacations,coordination with other tournaments, etc. We hold a spring tournament so that students who began calculus during the fall semester will at least be into the second semester at the time of the tournament.

2. Reserve the gymnasium. You need a large open room to conduct the afternoon competition. A gymnasium is excellent since tables can be set up where teams can work together. We also hold our morning competition in the gymnasium and use dividers on the tables to separate the competitors as they work on the individual portion of the competition. A large lecture hall is not appropriatefor the team competition but could be used for the morning individual competition.

3. Generate or update your mailing list. You need to decide on the scope of your tournament. Are you going to invite the colleges of your area? your state? a several state region? Your mailing list should consist of department chairs and/or previous sponsors.

4. Check with local motels and see if any will offer special rates for visiting teams who need to stay overnight.

5. Submit an announcement to the appropriate professional newsletter. Give as many details as you can. Include your address and telephone number so that readers can contact you for more information.

B. Four months before the tournament

1. Make an agenda for the day of the competition.

2. Mail first letter of announcement of tournament with an invitation to attend. Include as many details as you can. If you will be awarding cash prizes, tell what they will be. Include a copy of last year's individual test, and a sample of afternoon questions. Include a registration form, an agenda, motel information, a map, and say if

there is any limit on the number of competitors a college may send (we have no limit). If any of these are not yet ready, don't fret. They can be sent in a second letter later. The important thing is to give plenty of advance notice to the other colleges with as many details as you can, even if it's only the date of the tournament.

3. Reserve the marquee. If you have a marquee, especially one near the tournament site, reserve it for the week of the tournament. It will add to the warmth of the event when the competitors see a welcoming message as they arrive.

4. Begin collecting questions for the competition. Naturally, it is best and the most rewarding to write your own original questions. But don't hesitate to use other sources. Ideas can be generated by looking at contest books, textbooks, etc. Sometimes you might just want to modify questions you find. If you use such sources, use a multitude of them. Don't take too many questions from any one source or inspiration. For the morning calculus test, you need fifty multiple choice questions through the level of the second semester of calculus. For the afternoon competition, you need twenty short answer questions from any area of mathematics up to the level of second semester calculus. These should be questions which are **possible** to answer within a few minutes. There should be much variety.

5. Begin local advertisement of the event. You want to generate interest among your best mathematics students.

6. If this is your first tournament, and you are using your gym for the morning competition, then you will need dividers for the tables. These can easily be made by making a groove in a wood base and inserting a piece of hardboard to stand vertically. These dividers are to separate competitors sitting directly across from one another. Assign seating for the morning competition so that no two students from the same college are at any one table. If this is not your first tournament, do you need additional dividers due to growth?

C. Two months before the tournament

1. Send a follow-up letter to persons on your mailing list with more details of the tournament, if necessary. You might want to use two forms for this letter - one for colleges that have already registered and one for colleges that have not yet responded to the first letter. This second letter may not be necessary if the first letter contained all of the information necessary. Your might want to use telephone calls instead of, or in addition to, a second letter.

2. Make a first draft of the morning test. Recruit faculty to proof it for you and make recommendations for improvement.

3. Make a first draft of the questions for the afternoon competition. The twenty questions need to be grouped into ten rounds with from one to four questions

per round. Use one page for each round. Again, recruit faculty to proof and make recommendations.

4. Arrange for the catering of food. You will probably want a continental breakfast served at your registration site. Lunch can be served in your cafeteria, at an off-campus site, or brought onto campus. You may not have any or much choice if your college has a food service with an exclusive contract. Except for awards, this will be your greatest cost in running the tournament.

5. Arrange with your physical plant for set up on the day of the tournament. Order tables (8 ft best, 6 ft acceptable), chairs, decorative plants. Give them a diagram of how you want the gym set up. You need one table for each team expected plus tables for registration, scoring, breakfast, and overhead projectors (5). You need one chair for each competitor, plus chairs for sponsors, local spectators, and helpers. Order plenty.

6. Arrange with A/V for you needs on the day of the tournament. You will need a sound amplification system and five overhead projectors with extension cords and five screens. Four of the overhead projectors are to project answers to the afternoon questions at the end of each round. The fifth is to project competition standings at the end of each round. You could instead use a blackboard for the later if desired.

7. If you want to distribute any mementos at your tournament, you need to order them by this time.

8. Begin to recruit helpers for the day of the tournament. In the early morning you need help with getting ready for the morning competition, greeting the visitors, registering, and socializing during breakfast. Are you going to have an official welcome from a high ranking person at your college? During the morning competition, you need proctors, and a leader and local participants for an articulation session with the sponsors. During lunch, you need an escort, a photographer, someone to score the morning tests, and help with setting up the gym for the afternoon competition. During the afternoon competition, you need a master of ceremonies, several proctors to collect answer sheets, scorers, and someone to display transparencies of the solutions at the end of each round. During the award ceremony, a master of ceremonies and a photographer are needed. This does not necessarily mean as many people as it might sound; one person can do several of these jobs. The proctors collecting answer sheets in the afternoon can be students (maybe from an honor society on campus) or visiting sponsors. We often use outstanding high school students, who in exchange for their service in the afternoon are permitted to take the morning test just for the fun of it.

9. Continue to generate interest locally. Ask faculty to help you identify and recruit outstanding talent for your local teams. Prepare a news release for your college newspaper.

D. One month before the tournament

1. Make the last draft of your morning test and send to the printer.

2. Make the last draft of your afternoon questions and send to the printer.

3. Order trophies and plaques. We give trophies to the top three teams and plaques to the top five individuals. We may increase the number as the competition grows.

4. Begin to assemble your college's teams. We have no limit on the number of students who can compete. Team members should be encouraged to get to know one another so that they can work well together during the afternoon portion of the tournament.

5. Write complete solutions for the afternoon questions, one solution per page. Send these to the printer so that a packet of solutions can be given to each college at the end of the competition.

6. Have transparencies made of the solutions to the afternoon questions. These will be displayed using overhead projectors at the end of each round.

7. Have answers to the multiple choice morning test printed. Each student should receive one immediately at the end of the morning competition.

8. Write tie-breaker questions. These are needed in case any individuals or teams tie for an award. This avoids having to obtain additional trophies or plaques after the competition. It also makes for more excitement right before the award ceremony.

9. Write an information sheet explaining the rules and procedures of the afternoon competition and send to the printer.

10. Make a registration form for the morning of the competition and send to the printer.

11. Obtain any supplies that you will need for the tournament. These include electronic grading forms for the morning test, pencils (at least two per student), tablecloths, name tags, tape, marking pens, and film.

12. Prepare and print answer sheets for the afternoon competition. Each team needs one answer form for each of the twenty questions.

13. Make team signs for the two ends of each table for the afternoon competition. These can be simple 8 1/2 by 11 sheets with the team name in large letters. You could make these with a word processor or ask your graphics arts department to make them for you. For colleges with more than one team, distinguish teams by using a letter or number suffix, e.g. Boston A, Boston 1, Boston B, Boston 2, etc.

14. Make any signs you might need to direct visitors arriving the morning of the competition.

15. Decide what you are going to have the sponsors do during the morning competition. A free-form discussion, a discussion with a predetermined theme, or computer demonstrations are possible activities.

16. If you are going to use a computer to help you with bookkeeping and scoring during the tournament, make sure you know exactly how you are going to do that. Practice.

E. One week before the tournament

1. Prepare the electronic grading forms for the morning tests by numbering them. Students will be assigned numbers on the day of the tournament, both for identification purposes and seat assignment.

2. If lunch involves choices, prepare a menu so that students, sponsors, and helpers can make their selections in the morning and a report can be delivered to the caterer.

3. Call security and arrange for the gym to be opened the morning of the competition.

4. Call physical plant and confirm prior arrangements.

5. Call A/V and confirm prior arrangements.

6. Call caterer and confirm prior arrangements.

7. If you are going to use the gym scoreboard for keeping time during the tournament, arrange for its use. If it's your first tournament, you may need some training.

8. Sharpen pencils.

9. Borrow some electric pencil sharpeners to take to the tournament.

10. Make up packets of answer sheets for the afternoon competition, one packet of twenty per team. We like to fill in the team names ahead of time so that the packet of answer sheets is ready for use at the beginning of the afternoon competition.

11. Take one packet of answer sheets for the afternoon competition and make a key for the scorer(s) to use during the competition.

12. Make an answer key for the morning test on an electronic scoring sheet so that you can quickly grade the morning tests on the day of the competition.

13. Make sure you will have access to an electronic grading machine on the day of the competition.

5. The day of the tournament

A. Early morning

1. Set up the registration table.

2. Set up the head table.

3. Check out equipment. Strategically locate pencil sharpeners.

4. Ready the tables for the morning competition by putting out the dividers (numbered), answer sheets (number on answer sheet must match number of seat), scratch paper, and pencils. Do not put out the test booklets until the competition is ready to begin.

5. Assist the caterer setting up breakfast, if necessary.

6. Greet arrivals, register, make name tags, assign a number to each student so that competitors from the same college will not be at the same table, write this number and team suffix on the name tag. Collect lunch menus, if used.

7. Socialize. Since teams may begin arriving as much as one hour before the competition begins, there will be time to meet the sponsors and students.

B. Morning competition (individual)

1. Official welcome.

2. Ask competitors to find the seat whose number matches the number on his or her name tag.

3. Begin to distribute the test booklets while a brief description of the morning competition is given. Advise the contestants to mark their answers on their test booklets as well as their answer sheets so that they can check how they did at the end of the competition. However, also advise them that the answer sheet is official. Invite the sponsors to the articulation session. Begin the competition. If you are using the gymnasium scoreboard, start the clock with ninety minutes.

4. During the articulation session, explain the afternoon competition to the sponsors. Also, explain that all protests must be made and settled before the award ceremony begins. Once the award ceremony begins, all results are final (for both the individual and team competitions.) Also, explain the "one trophy per school" rule (see Award Ceremony), if you are going to use it. If there are competitors who do not have a team, try to make unofficial multi-college teams so that these students can participate in the afternoon competition.

5. One person must spend some of the time during the morning competition to enter the competitors (and team compositions) into the computer.

6. At the end of the morning competition, collect all of the answer sheets. Each student should then be given a list of the answers to the questions. Allow them to keep the test booklets and any scrap paper.

C. Lunch

1. Someone needs to escort the competitors, the sponsors, and the helpers to lunch.

2. Take group photographs of the delegation from each college.

3. One person must skip lunch to grade the morning tests with an electronic grading machine, enter the scores into the computer, print reports of the individual competition for distribution at the end of the day, and ready the computer for the afternoon competition.

4. Others must hurry back from lunch to prepare the gym for the afternoon competition. The dividers must be collected, the tables cleared of any used scratch paper (leave the pencils), the team signs put on the ends of the tables, the packets of answer sheets distributed on the tables, and scratch paper distributed.

D. Afternoon competition (team)

This is the most exciting part of the day. It is also the time when the most help is needed. At the beginning of each round, problem sheets are distributed face down to each competitor (four per table). When everyone is ready, the master of ceremonies gives the signal to begin. Proctors are needed to collect answer sheets and mark them

with a possible point value depending on elapsed time. We start the scoreboard clock at 11 minutes on each round. The possible point value is then whatever the minutes reading is on the scoreboard (truncate the seconds). Proctors need to be trained to bring the answer sheets to the scorer's table only when the minute is not about to change. When the minute is about to change, proctors need to be at their stations to determine the possible point value. The competitors need to be instructed to turn in their answers by holding the answer sheet high in the air when ready to turn in. Once an answer sheet is held high in the air, it is considered turned in and can not be withdrawn. When an answer sheet is brought to the scorer's table, the scorer(s) determine if it is correct or not. If it is correct, the points are awarded and the sheet is given to the computer operator, who enters the score into the computer. In this way an up-to-the-minute status can be maintained on the team competition. At the end of each round, each team knows exactly where it stands in the competition. Also, at the end of each round, the solution(s) for the problem(s) of that round is/are displayed using overhead projectors. You might want someone to take candid photographs during the afternoon competition.

At the conclusion of the afternoon competition comes tie-breakers, if there were any ties in the individual or team competition where trophies or plaques are involved. The same question can be used to break individual or team ties, provided an individual is not involved two ways, of course. It is not necessary to announce what place any individuals are tied for, just that they are tied.

E. Awards ceremony

1. Award the team trophies first (It is no secret who has won when you have instantaneous scoring). We use a "one trophy per college" rule. If a college has two teams which finish high, it gets to keep the best trophy. The other team is honored and photographed with the other trophy, but then the trophy is awarded to the next highest team from a college which has not yet received a trophy.

2. Award the individual plaques, and announce any accompanying cash awards.

3. Someone should take photographs.

F. End of the day

1. Distribute reports for each college (prepared during lunch), showing the top individuals for the morning competition and the morning scores for all of that college's competitors.

2. Distribute a report of the afternoon competition (same report to each college).

3. Distribute a copy of solutions for the afternoon questions (one set per college). These are identical to the transparencies shown after each round.

4. Say good-byes and invite everyone back for next year.

5. Gather and tidy.

6. Call security to lock up.

6. After the tournament

A. The next day

1. Take film to be developed.

2. Prepare a press release for the college newspaper and the local newspaper. This should be given to the information director at your college.

B. Within one week

1. Write a letter to each college thanking them for participating. Include photographs and an evaluation form. Include printed results of the competition if not given at the end of the tournament.

2. Write thank you letters to everyone who helped.

3. Arrange for dispersion of prize money.

4. Arrange for the caterer to be paid.

5. Write a report for the appropriate professional newsletter.

6. Update your mailing list with any new information you may have.

7. Make notes to help you for next year.

7. You can do it !

Yes, it is a lot of work. But with this detailed guide to help, you can conduct a tournament for the two-year college mathematics students in your area. Your reward will be found in the faces of the competitors on the day of the tournament.

It is the dream of the authors that tournaments like these will be conducted throughout the country, with the possibility of someday having a national tournament between winners of regional tournaments.

If you have any questions or need any help or advise on conducting your tournament please contact us. We are always glad to help.

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Free software (IBM), featuring a dynamic up-to-the-minute scoreboard for the group competition, is available from the authors. It will produce printed reports of both the individual and the team competitions.

Appendices

Guidelines for establishing a budget.

1. Awards.

Awards are a major budget factor. We gave cash awards totaling $1000 for each of our first two tournaments ($600 - 1st, $300 - 2nd, $100 - 3rd). We gave trophies to the top three teams and last year gave plaques to the top five individuals. As our tournament grows, we would like to give more and greater awards to individuals. Figure about $40 for each trophy and $30 for each plaque.

2. Food.

For a continental breakfast and lunch, figure at least $6 per person. Don't forget to count sponsors and helpers.

3. Photography.

This could be considered an optional cost, but being able to send photos to the competing teams after the tournament adds a touch of class. Figure about $50 for film, developing, and printing.

4. Supplies.

You need pencils (at least two per contestant), electronic grading forms, transparencies, name badges, tablecloths (for head tables and registration tables), tape, markers. $50 should easily cover supplies. For your first tournament, you will also have the cost of the materials for the dividers if you are using your gym for the morning individual competition.

5. Printing.

This is probably not a cost consideration since hopefully you can use the normal printing facilities at your college to meet your printing needs.

Santa Fe Community College
3000 N.W. 83rd Street
Gainesville, Florida 32606

Dear _____,

Good News! We are hosting a mathematics tournament at Santa Fe Community College on February 27, 1993. All community colleges in Florida are invited to participate. Trophies will be awarded to the top three colleges and to the top five individuals. Also, individual winners will win the following prizes.

First place	$600 scholarship money
Second place	$300 scholarship money
Third place	$100 scholarship money

Please attend this contest. Your students will have a memorable experience, and the sponsors will have a great time! Just return the enclosed entry form by January 10, 1993.

Best regards,

Jeff Isaacson
coordinator

enclosures

Sample letter of invitation to participate.

MATHEMATICS INVITATIONAL

Date: February 27, 1993 Location: Santa Fe Community College

Please check the appropriate space.

_____ Our community college will not be sending any representatives to the competition.

_____ Our community college will be represented by _____ students.

_____ _____

Team Sponsor(s) Community College

Sample form for a college to register to participate. Enclose with letter of invitation.

GENERAL INFORMATION

Location	Santa Fe Community College Gymnasium, Gainesville, Florida
Date	February 27, 1993
Registration Fee	None
Testing	A fifty question multiple choice test will be given in the morning. The emphasis of this test will be on topics from the first two semesters of the traditional calculus sequence. Team questions will be administered in the afternoon. These questions will be from topics in calculus, precalculus, geometry, logic, probability and number theory.
Teams	Each team will have four members. You may bring as many teams as you want. You may also bring an incomplete team since all students can compete in the individual competition. We will attempt to fill in incomplete teams for the afternoon contest.
Awards	First, second, and third place trophies will be awarded in both the individual and team competition. Winners will receive the following prizes: First place -- $600 scholarship Second place -- $300 scholarship Third place -- $100 scholarship Fourth place -- Derive software.
Scoring	The individual scores will be determined by the morning fifty question multiple choice test. The team scores will be determined by the sum of the four team members' individual scores and the afternoon team score. The two components will be equally weighted.

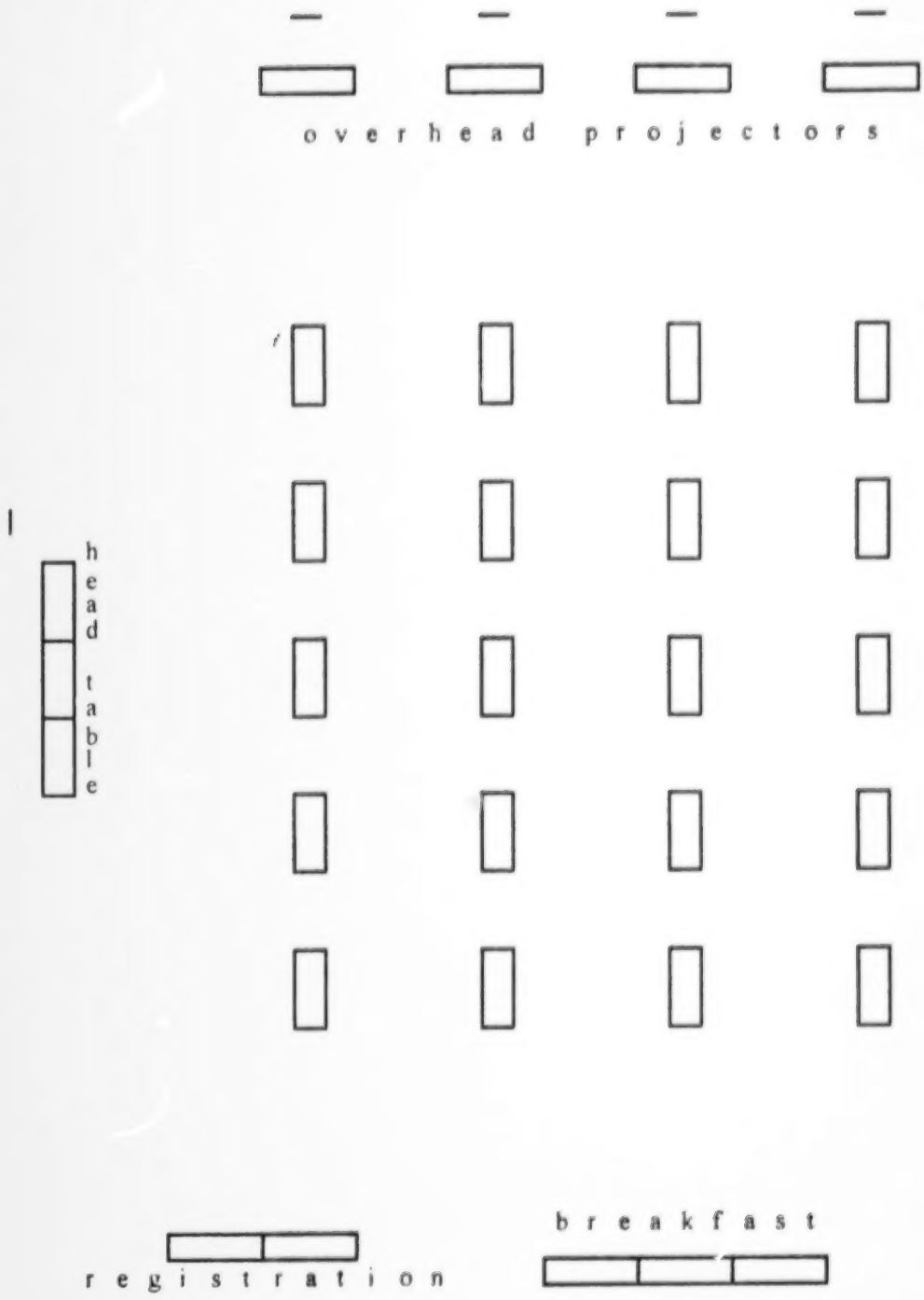
Sample General Information Sheet. Enclose with letter of invitation, or perhaps with a later second letter.

Second Annual
Santa Fe Community College
Mathematics Invitational Tournament

February 27, 1993

8:30 - 9:30 a.m.	Registration and breakfast
9:30 - 11:00 a.m.	Individual competition
11:00 - 1:00 p.m.	Lunch (provided by SFCC)
1:00 - 3:30 p.m.	Team competition
3:30 - 4:00 p.m.	Awards

Sample agenda for the day of the tournament. Enclose with the letter of invitation or with a later second letter. You also need to send a map and motel information.



Sample gym layout.

Santa Fe Community College

Invitational Mathematics Tournament

February 27, 1993

Registration Form

college Lake City C.C.

sponsor(s) Rose Dana

Wiley Russell

competition participants

team A

Sean Adams 37

Amy Taylor 38

Tara Crews 39

Mike Twardy 40

team B

Galen Bishop 41

Hiroshi Kato 42

[illegible] 43

[illegible] 44

team C

[illegible] 45

[illegible] 46

[illegible] 47

[illegible] 48

Sample registration form for the morning of the competition. This is to obtain the competitor's names, the composition of the four person teams, and to assign numbers to each competitor. Notice that the competitors from the same college have been assigned consecutive numbers. The seats are numbered for the morning competition so that consecutive numbers are at different tables.

SANTA FE COMMUNITY COLLEGE

SECOND ANNUAL

INVITATIONAL MATHEMATICS TOURNAMENT

FEBRUARY 27, 1993

MORNING COMPONENT

Good Morning!

Please do not open this booklet until given the signal to begin.

There are 50 multiple choice calculus questions. They will be used to determine the individual champions and count toward your team score also.

Answer the questions on the electronic grading form by giving the best answer to each question.

The scoring will be done by giving one point for each question answered correctly and zero points for each question answered incorrectly or left blank. Thus, you should answer all of the questions, even if you have to guess.

You may write in the test booklet. You may keep the test booklet and any of your scrap papers. Only the electronic grading form will be collected.

Good luck!

DO NOT OPEN UNTIL SIGNALED.

Sample cover sheet for the morning individual test.

8. If $f(1) = 3$ and $f'(1) = 5$ then $\frac{d}{dx} x^2 f(x)\Big|_{x=1}$ equals

a) 3 b) 7 c) 8 d) 10 e) 11

9. Find $\int_0^{+\infty} e^{-3x} dx$.

a) -3 b) $\frac{1}{3}$ c) 1 d) 3

e) The integral is divergent.

10. $\int_{-12}^{-2} \frac{1}{x-3} dx =$

a) $-\ln 10$ b) $-\ln 3$ c) $-\frac{8}{225}$ d) $\ln 3$ e) $\ln 10$

11. $\int_{f(0)}^{f(1)} f'(x)\, dx =$

a) $f(f(1)) - f(f(0))$ b) $f(1) - f(0)$ c) $f'(1) - f'(0)$

d) $f'(f(1)) - f'(f(0))$ e) $f''(f(1)) - f''(f(0))$

12. Find the absolute maximum value of $f(x) = -xe^x$

a) $-e$ b) 0 c) $\frac{1}{e}$ d) e

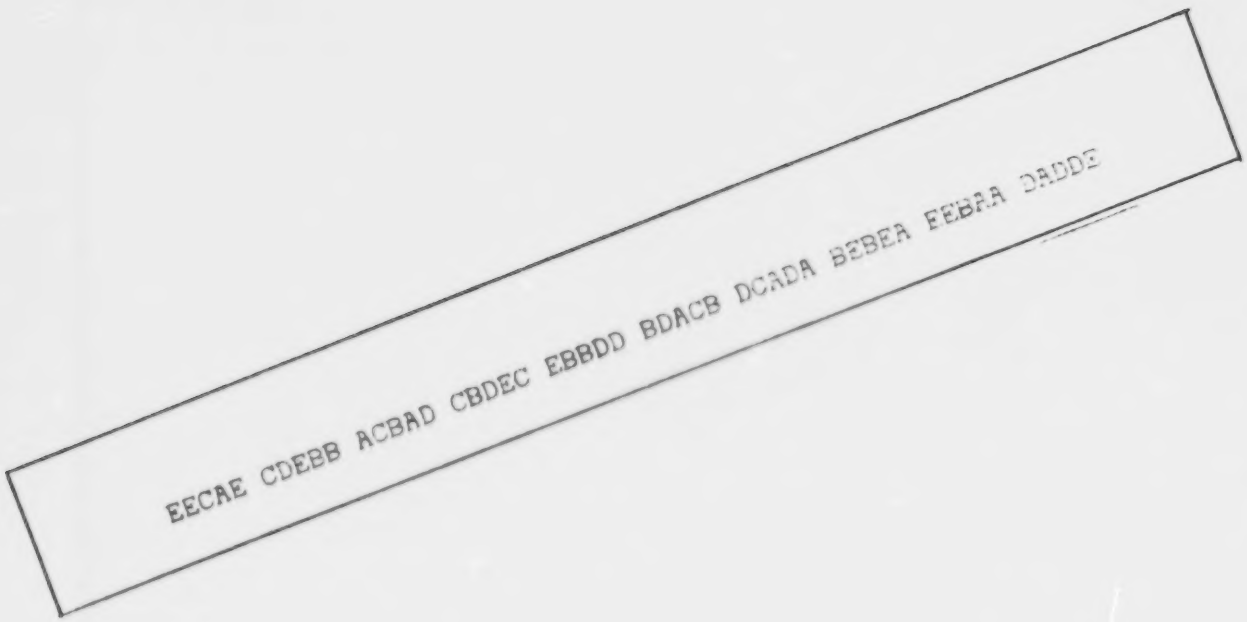
e) There is no absolute maximum value for $f(x)$.

13. If $f(4) = 14$ and $f'(4) = -3$, then, using differentials, $f(4.06)$ is estimated to be

a) 11 b) 13.82 c) 13.94 d) 14.06 e) 14.18

2

Sample test page for the morning individual test.



Sample answer key for the morning individual test. Have plenty of these printed so that each competitor and each sponsor can have one. Distribute to the competitors immediately upon completion of the individual competition. Allow them to keep their test booklets. Before the test begins advise them to mark their answers in their test booklets so that they can compare with the answer key at the end of the test. Also advise them, however, that their answers on the electronic grading form are the only official ones. Any protests must be made before the award ceremony begins at the end of the day. At that time all results become official, even if errors are found.

SANTA FE COMMUNITY COLLEGE

INVITATIONAL MATHEMATICS TOURNAMENT

FEBRUARY 27, 1993

AFTERNOON COMPONENT - TEAM COMPETITION

The afternoon component of the competition consists of ten rounds. During each round, teams work from one to four problems. A problem answered correctly within one minute earns ten points, within two minutes nine points, within three minutes eight points, etc. A problem answered incorrectly earns zero points. There are a total of twenty questions in the afternoon competition with a total possible value of 200 points. The team score for the competition is the sum of the four individual scores from the morning competition and the scores on the twenty afternoon questions for a total possible score of 400.

Teams write their answers to the afternoon questions in the box on the appropriate answer sheet and give the sheet to a proctor who records the possible point value based on time. Each team will have one answer sheet for each question. In rounds where there are multiple questions, the answer sheets may be submitted in any sequence whatsoever and at various times.

Round 1:	Problem 1			
Round 2:	Problem 2	Problem 3		
Round 3:	Problem 4			
Round 4:	Problem 5	Problem 6	Problem 7	Problem 8
Round 5:	Problem 9			
Round 6:	Problem 10	Problem 11	Problem 12	
Round 7:	Problem 13			
Round 8:	Problem 14	Problem 15		
Round 9:	Problem 16			
Round 10:	Problem 17	Problem 18	Problem 19	Problem 20

Sample information sheet for the afternoon team competition. Give one to each sponsor at the beginning of the articulation session during the morning competition. Go over the afternoon competition with the sponsors and advise them to explain it to their teams during lunch. At the beginning of the afternoon competition, have one of these sheets on each team table.

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PROBLEM 10

If half of half of the square root of one half more than x is twice the square root of half of x, what is half of the square root of x?

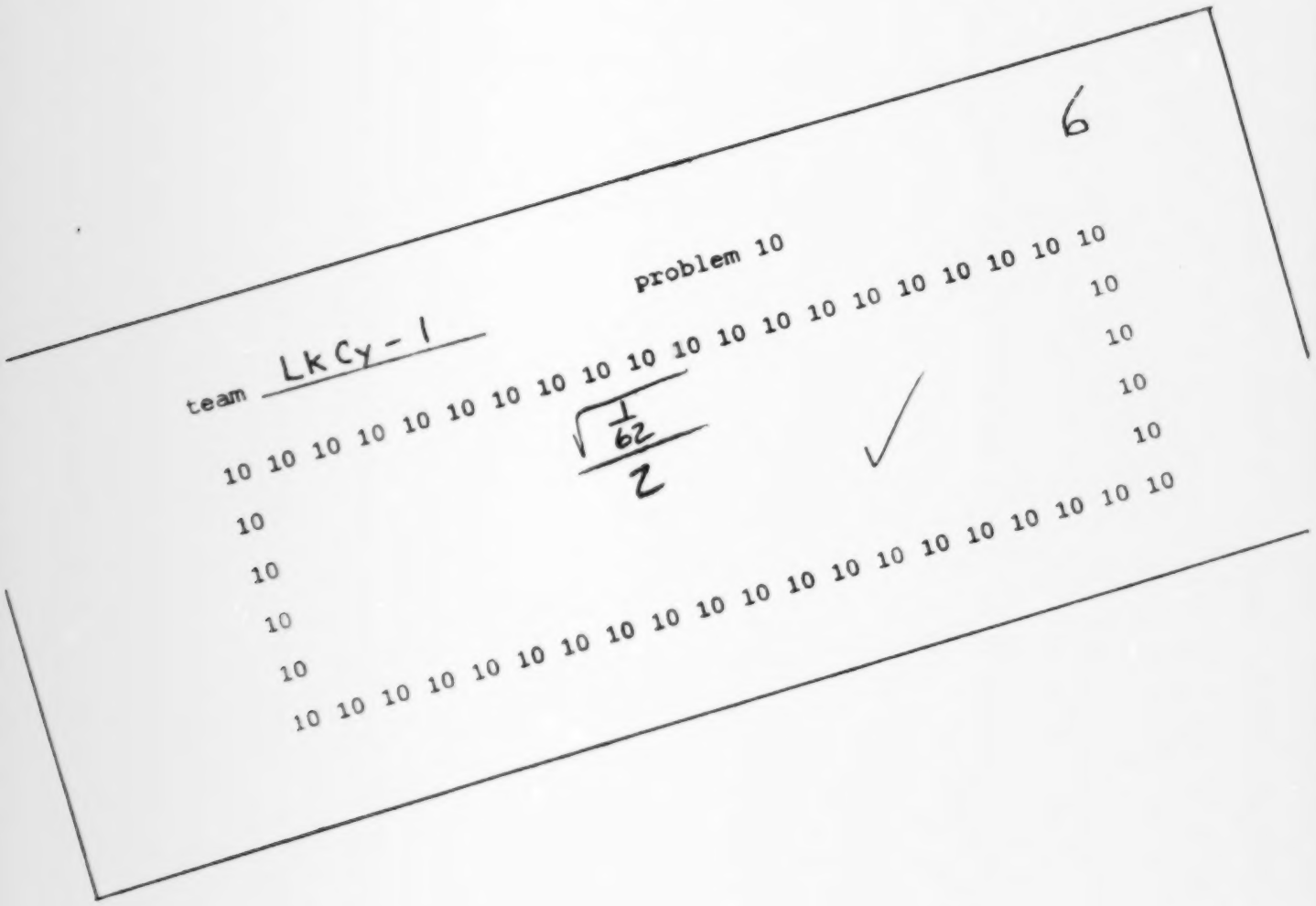
PROBLEM 11

What positive number has its square root nearest in value to its natural logarithm?

PROBLEM 12

Find the area of the smaller region cut off by a chord of length 10 in a circle of radius 7.

Sample problem page for one round of the afternoon team competition. This page is for round 6. Each competitor is given one of these pages, face down. At a signal the competitors turn over the page and begin working.


6
team LkCy-1
problem 10
10 10 10

Problem 4

When ten times a positive number is subtracted from the cube of the number, the result is twelve. What is the number?

Let x be the number. Then $x^3 - 10x = 12$.

The solutions for the equation are the zeros for the polynomial $x^3 - 10x - 12$.

The possible rational zeros are ± 1, ± 2, ± 3, ± 4, ± 6, and ± 12.

-2	1	0	-10	-12
		-2	4	12
	1	-2	-6	0

We see that -2 is a zero and that $x^3 - 10x - 12 = (x+2)(x^2-2x-6)$.

The zeros of x^2-2x-6 are $1 \pm \sqrt{7}$.

So the three zeros of $x^3-10x-12$ are -2, $1+\sqrt{7}$, and $1-\sqrt{7}$.

$1+\sqrt{7}$ is the only positive number of the three.

Answer: $1+\sqrt{7}$

Sample solution page for a problem in the afternoon team competition.
Transparencies should be made of these so that they can be displayed at the end of the round. Further, packets of hard copies of all the solutions to the afternoon questions should be made for distribution at the end of the competition (one per college).

Santa Fe Invitational Math Tournament

We need your help in making this event most enjoyable for you and your students. Your comments are highly valued.

- **What did you think of the test content?**
- **How appropriate was the level of difficulty?**
- **Do you feel that the length of the test was too long? too short? about right?**
- **Do you think the grading was fair?**
- **Were the amenities satisfactory?**
- **Do you have any other suggestions or comments?**

Sample evaluation form. Mail to each college soon after the tournament. This not only gives you information about your just completed tournament, but may give you ideas for improving next year's tournament. Please share such ideas with the authors.